more marked. The principal feature to bear in mind, in the use of this form of apparatus, is to regulate the inflow and outflow so that the pressure of the air under the bell glass coincides with that outside of it. The amount of carbon dioxide which plants absorb is sufficiently large so that with the use of either of these appliances a slight error in the determination does not prevent their being utilized for demonstration purposes. Such experiments may well precede those with the Pfeffer gas-balloon, in which case more careful details in regard to pressure and tension have to be insisted upon.

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OBSERVATIONS ON PHALLUS RAVENELII

BY HOWARD J. BANKER

In the fall of 1900, several beds of *Phallus Ravenelii* were found in piles of sawdust at Williamsport, Pa., with the plants in all stages of development. "Eggs" were found in abundance from the size of a mustard seed to that of a walnut. In a space less than three feet square over a hundred and fifty were gathered, all larger than a pea while hundreds of smaller ones were to be found. The sawdust was penetrated in every direction by long strings of cord-like mycelium. Most of the smaller "eggs" failed to mature, being checked by the frost, but the plants persisted in coming up until the middle of December or until the ground actually froze hard.

One of the beds was located under a pile of lumber, where it was more shaded and more moist. The *Phalli* in this bed were larger and of more vigorous growth than those in the open. Tempted by their size, the writer made an effort to crawl under the lumber pile to them. The sawdust was found to be remarkably full of what was taken to be masses of "eggs" and unusually matted together by the mycelium, but it was too dark to see clearly of what the material consisted. A quantity was therefore gathered and on returning to the light proved to be very different from what was expected. There was a dense mass

of mycelium forming a tangled net-work and filled with very irregular tubercular masses, ranging in size from .5–5 cm. in diameter.

These tubercles or sclerotia appeared to be enlarged portions of the mycelial threads and were twisted, lobed and convoluted in a very irregular manner. On making sections of these it was found that they consisted of two distinct parts, an outer wall about 2 mm. thick and an inner cavity which either contained only air or was filled with a gelatinous substance. This cavity was observed at this time, in the fall, to be in a state of negative pressure. Those tubercles which had their cavities filled with air would float in water while those containing the gelatinous substance would sink. It was therefore easy to determine, without injury, the character of the different tubercles in this respect.

The wall of the tubercle consisted of a dense weft of mycelium forming apparently a pseudoparenchyma. This was most compact toward the outer surface and became more open toward the interior, terminating at the surface of the interior cavity in numerous free ends. These hyphal ends were about 7 μ wide and quite irregular in form. When the cavity contained the gelatinous substance, this was found to be everywhere penetrated by fine branching threads about 3 μ wide, of uniform size, and running in nearly straight lines. These threads, easily distinguished from the hyphae previously mentioned, seemed to have their origin in the outer wall of the tubercle but just how could not be made out.

There was also observed in the jelly-containing tubercles, certain peculiar bodies which were supposed from their appearance to be crystals of calcium oxalate. These were not numerous and were developed chiefly among the free hyphae on the inner surface of the wall. A portion of a hyphal thread would be enlarged into a globular form about 40 μ wide and would contain within it a spherical body about 22 μ wide and marked with fine radiations.

The larger tubercles in many cases had the appearance of being made up of a fused mass of smaller ones. One such conglomerate mass measured over 8 cm. in width.

The place was not again visited until spring. In April, the lumber pile having been removed, the place was made easy of access and was again examined more thoroughly. All external signs of the *Phalli* had disappeared, but the bed of sawdust was found densely matted together with mycelium which covered a space of several square feet and penetrated the sawdust to a depth of 12 to 15 inches. Throughout the mass there was an abundance of tubercles. They as well as the mycelial cords were now observed to be white in color where not exposed, but when uncovered quickly turned bluish-purple. This change of color was very marked and always occurred first in the finer threads of the mycelium where it would take place so quickly on exposure that it was very difficult to catch sight of the natural white color of the threads before the blue color appeared. For this reason the mycelial threads of *P. Ravenelii* are usually observed to be bluish-purple in color. In a few seconds the blue color would appear on the more exposed prominences of the tubercles, rapidly deepening in color and spreading over the surface, but not at first extending into the depressions between the prominences, owing apparently to the retention of some moisture in these places. The side of a large tubercle which remained in contact with the moist sawdust also underwent no change. This suggested that the change of color was due in some manner to a superficial drying resulting from contact with the air, which appeared to be confirmed by the fact that if the tubercles of the mycelium were immersed in water as soon as removed from the sawdust not only was further change of color checked, but after a few minutes the color which had already appeared faded out and the material soon became entirely white as at first.

By very long exposure to the air, that is, for several hours or days, the color gradually undergoes a further change, becoming a dark reddish-brown and spreading over the entire surface even into the deepest depressions, and this is more uniform and complete in the living plant remaining in contact with its substratum than when removed and dried.

This color change in the tubercles is confined strictly to a very thin layer of the surface and does not penetrate the inner sub-

stance. Even if the tubercle be cut through, the cut surface thus exposed undergoes no change in color, but remains of the same uniform white, and this distinction remains even when the tubercles have become very dark brown or have been thoroughly dried. The brown color is slightly soluble in water.

Specimens of this material have been preserved at the New York Botanical Garden. I have been hoping to have an opportunity to investigate further this color change in the mycelium of *P. Ravenelii* and determine if it was of the same character as the blue color that appears in certain *Boleti* when injured and which Schönbein has shown is due to the action of ozone.* Removal of residence and failure to find such a remarkable growth of these plants elsewhere has prevented my carrying the investigations further.

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JOSEPH HINSON MELLICHAMP

BY WILLIAM M. CANBY

Dr. Mellichamp — an excellent botanist of South Carolina — died on James Island in that State on the second of October last.

Joseph Hinson Mellichamp, the son of the Rev. Stiles and Sarah Cromwell Mellichamp, was born in St. Lukes Parish, South Carolina, on the 9th of May, 1829. His father was for many years Preceptor of Beaufort College and afterwards was pastor of St. James Church on James Island. Being a lover of outdoor life and of natural objects, he gave his son a taste for the same and especially for botany, which continued throughout his life. In 1849 he graduated from South Carolina College and in 1852 from the Medical College at Charleston. He then spent some time in Europe, studying in the hospitals of Dublin and Paris. On his return he established himself as a physician at Bluffton, South Carolina, and here he remained most of his life — the exceptions being the time when he was a surgeon in

* Cf. De Bary, Comp. Morph. and Biol. of the Fungi, 15.